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(54) **Method and apparatus for metering beverage concentrates**

(57) A method and apparatus for the automatic dosing of a beverage concentrate in a beverage vending machine, wherein a reservoir (1) containing the concentrate to be dosed is connected to the passive section of a diaphragm pump, the latter section comprising a resilient appendix (3) for holding liquid provided with a first non-return valve (7) opening into the interior of the appendix (3) and a second non-return valve (9, 10) opening to its outside. The force exerting section of the diaphragm pump is carried integrally with the body of the vending machine and is shaped so as to tally with and receive the passive section of the pump by simple insertion without requiring disassembly of the force exerting section or distortion of the passive section. The passive section is normally fixedly connected to the reservoir, the latter elements together forming a disposable unit.

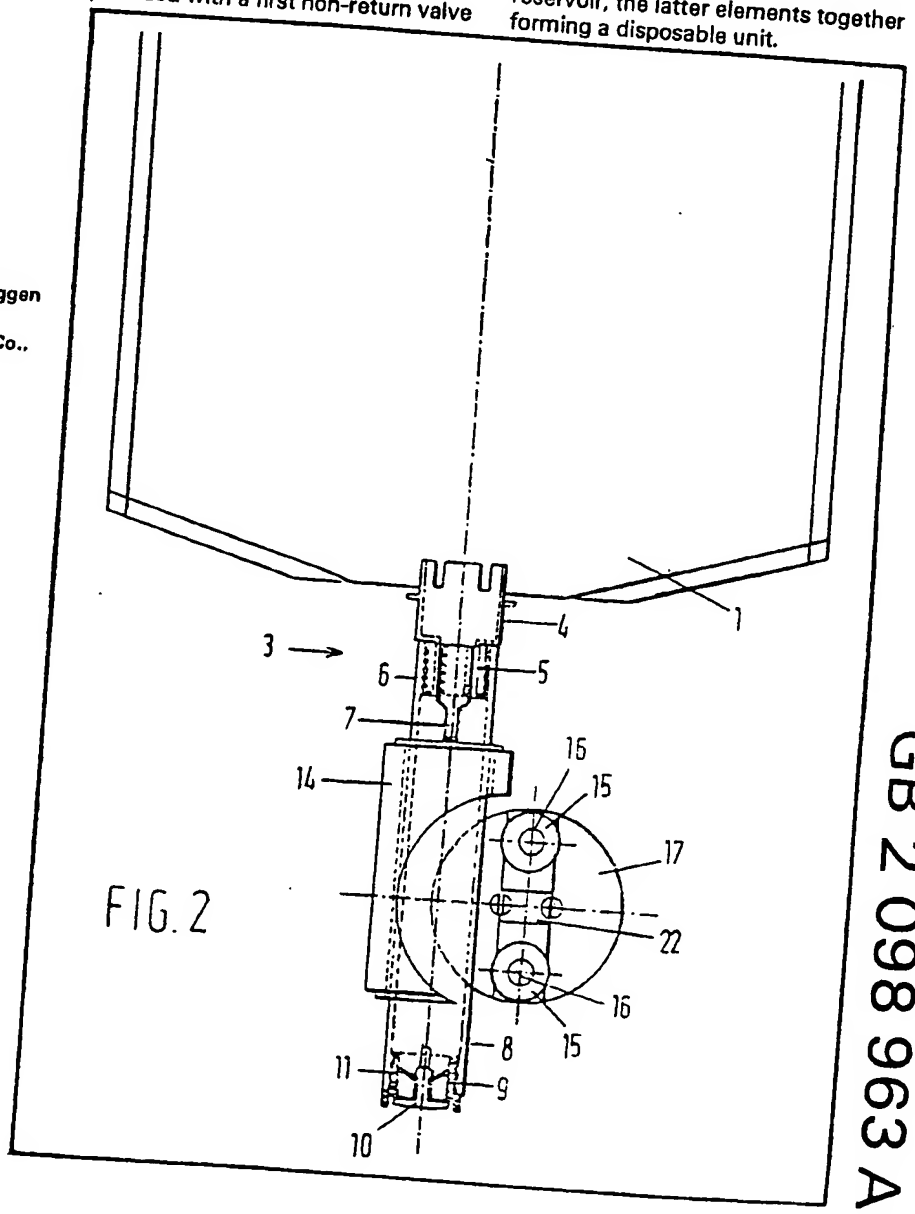

FIG. 2

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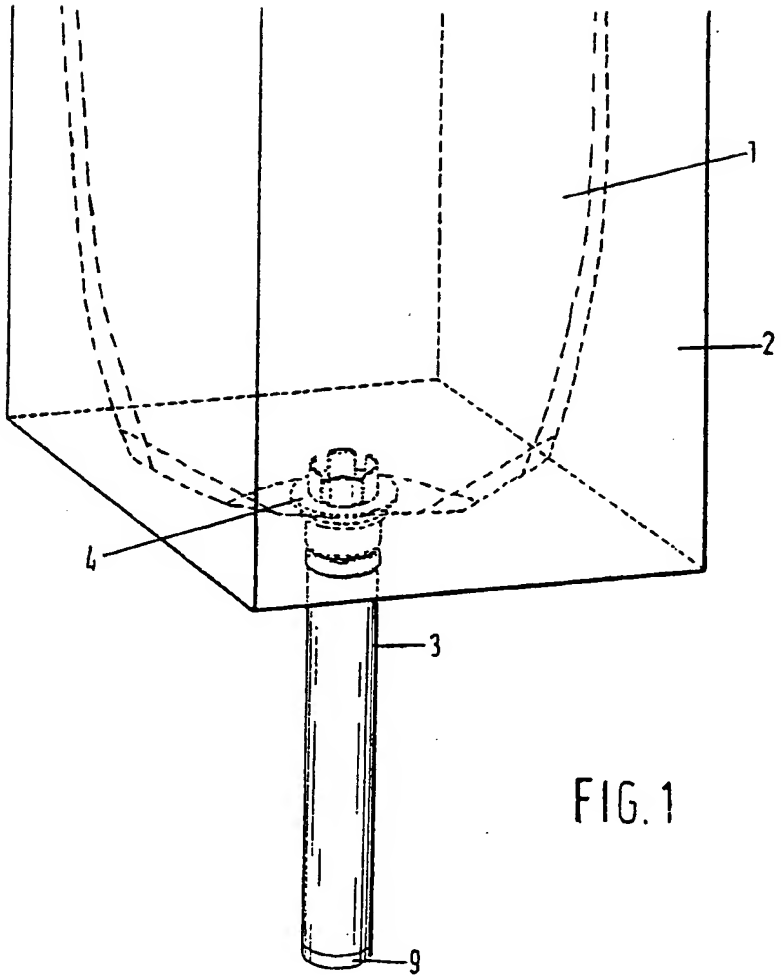
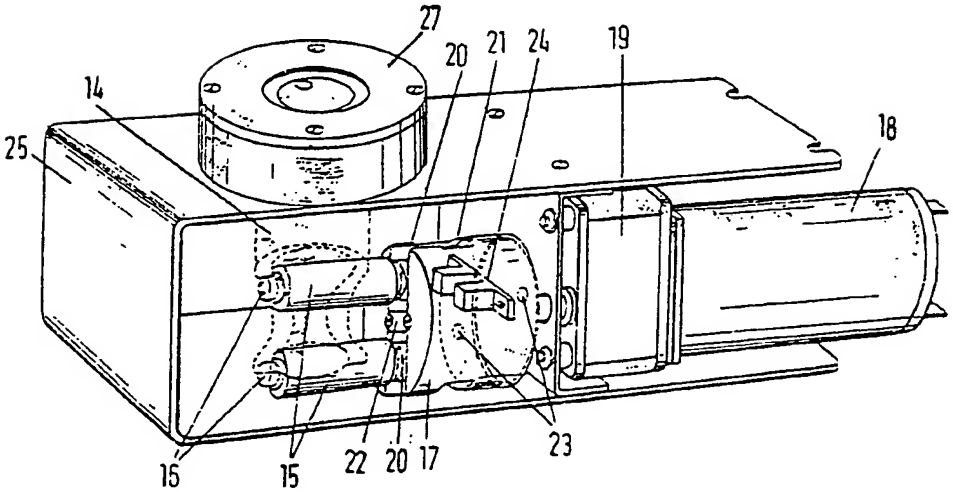


FIG. 1



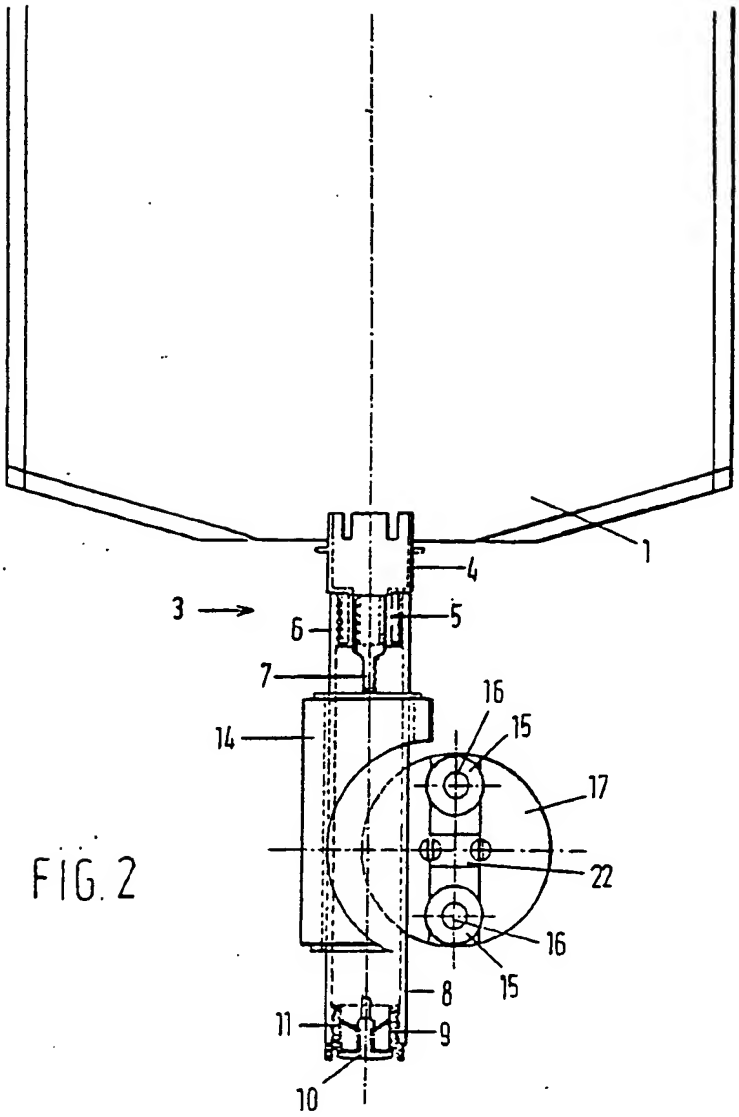


FIG. 2

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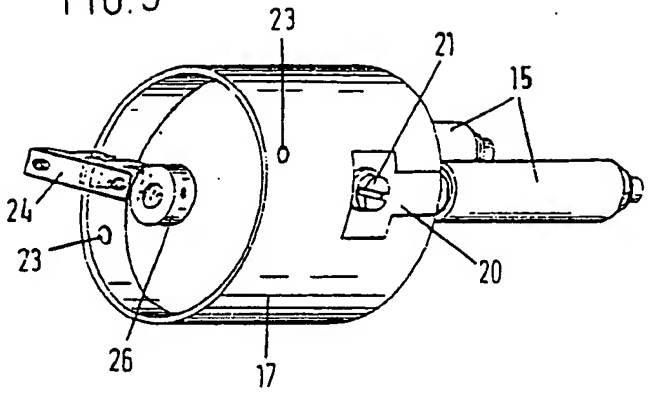
FIG.3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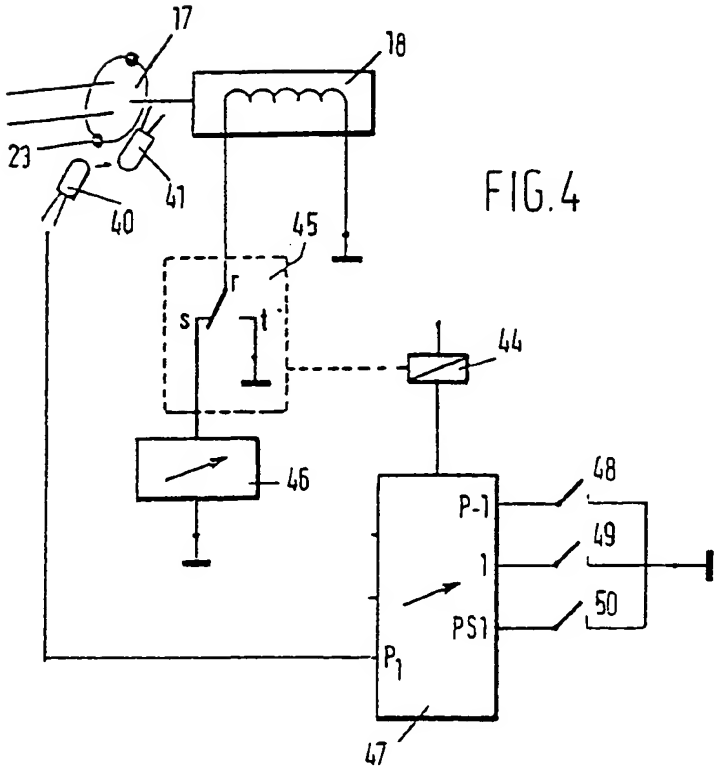
17
18
23
41
40
45
r
s
t
44
46
48
P-1
49
1
50
PS1
P1
47

FIG.4

SPECIFICATION

Method and apparatus for metering beverage concentrates

The invention is concerned with a method of metering beverage concentrates.

Beverage vending machines are used in large numbers throughout the world. In them, in response to a signal—generally an electrical signal—a small quantity of beverage concentrate is dispensed from a container into a cup and diluted with cold or hot water. Timed metering is often used, which means that a valve is opened for a pre-determined period of time. This has the disadvantage that, even if provisions are made to compensate for hydrostatic pressure, insufficient accuracy is obtained with concentrates having a variable viscosity.

Furthermore, methods are known in which a specified volume is defined, which issues by gravity when a valve has been opened. This technique is subject to variable wall effects, which also adversely affect accuracy.

It is also known to divide the quantity to be metered into portions, which are expelled by the revolutions of an expulsion mechanism. In this system, use is made of the peristaltic pump principle. The number of revolutions of the pump then determines the metered quantity. Peristaltic pumps in beverage dispensing machines are well-known, and comprise a relatively flaccid hose laid in a circular or semi-circular bed. A rotary expulsion mechanism (for example with cams) presses the hose against its bed at two peripherally spaced positions. There is accordingly a defined volume of concentrate between the points where the hose is pinched shut, and the desired quantity of concentrates can be dispensed by causing the expulsion mechanism to rotate a pre-determined number of times.

The bed and the rotary expulsion mechanism may be fixedly mounted in the machine with the hose, normally mounted between these two parts, remaining permanently in position. When the container is empty, the hose must be disconnected from it, and the container re-filled or replaced by a fresh, full container. Disconnecting the hose and the container from each other gives rise to all sorts of undesirable situations. It is time-consuming, prone to spilling and contamination, and liable to introduce air in the hose.

Even if in a peristaltic pump the hose were to be fixedly connected to the container, and this combination were to be made as a disposable unit, it would be necessary for the rotary mechanism and the bed to be adjustable relatively to each other in order that the hose portion of the unit may be fixed in position. Replacing the unit would accordingly require unlocking at least one of the parts of the apparatus, moving it away from the other, then accurately replacing it in position and re-locking it. This entails inaccuracies in practice, for one thing owing to wear and tear of the adjusting device. Also, placing the hose in its bed in the form of a segment of a circle does not preclude the risk of spilling. The hose must be forced to assume a curved shape, and this operation may cause an undue increase in internal pressure, whereby liquid runs out. Also, as practice has shown, depending on the position of the rollers, the hose is stretched to a greater or lesser extent, resulting in variation in metered volumes per revolution. This is promoted by the circumstances that the hose must necessarily be relatively flaccid, as the expulsion mechanism must be capable of squeezing it completely shut without leakage. In addition to the disadvantage that, as a result, the volume of liquid between the points where the hose is pinched shut is far from accurately defined, the flaccidity of the hose increases the risk of spilling while it is being handled while placing it in position in its bed, and clamping it between the bed and the rotary expulsion mechanism when, after the hose has been introduced, the bed and the expulsion mechanism are moved back into their relative operative positions and locked relatively to each other.

In our British patent application 32418/78 it has been proposed that the part of the metering device which comes into contact with the extract, in the form of a tube, should be fixedly connected to a container. In addition it is ensured that the tube is depressed in a highly accurately reproducible manner. The container plus metering tube can be regarded as a disposable unit, and gives excellent satisfaction, from the point of view of both hygiene and ease of operation.

In the method of operating the metering device as indicated in that application, it is not possible to vary the dose of extract—possibly for each dosage separately—in a simple manner. Moreover the method in practice depends on the pressure of the main water system, which pressure should be above a certain value. It is an object of the present invention to overcome the above drawbacks of the prior art.

The present invention provides a method and apparatus for the automatic metering of a beverage concentrate in a beverage dispensing or vending machine which permits very high metering accuracy, and great flexibility with regard to the dosing, with the possibility of extreme simplicity of "servicing", by virtue of the fact that a—as the case may be— disposable-reservoir containing the beverage concentrate is connected to the "passive" section of a diaphragm pump. and this section is arranged to be brought into automatic co-operation with the force-exerting section of said pump in response to an appropriate signal, which force-exerting section of the diaphragm pump is integral with the body of the dispensing or vending machine. Preferably said force exerting section is shaped in such a way as to tally with and receive said passive section of the diaphragm pump by simple insertion without disassemblage of said force-exerting section or distortion of said passive section of the diaphragm pump and said passive

means, responsive to an appr priate stop signal for stopping the dispensing when the count is equal to a desired number N, or a multiple thereof, while N=X/Y, the arrangement being such that on each pulse an accurately metered volume Y of of the beverage concentrate leaves the appendix through the first valve and subsequently an equal volume enters the appendix from the container through the second valve, the volume X being at least the six-fold of the volume Y.

The means responsive to an appropriate stop signal may be connected to the means responsive to an appropriate start signal in such a way that the start signal may automatically trigger the stop signal when the desired number of exertions is equal to N or a multiple thereof; this will be normally the case. Normally but not necessarily when a multiple of N is chosen this multiple will be an integer, so that a whole number of consumption units is dispensed.

Preferably the metering appendix and the force-exerting means should be constructed so as to tally in such a way that the first can be positioned in an accurately reproducible manner by simply sliding it in the latter. This is e.g. possible by providing the force-exerting device with an abutment, leading the dispensing appendix when it is inserted, against which the dispensing appendix is pressed by the force exerted on said appendix when the apparatus is functioning. As will be shown in more detail in the following, conveniently the metering appendix has an overall cylindrical shape and the force-exerting means is constructed in such a way that the positioning can be accomplished by vertically sliding in.

The volume X of beverage concentrate will range per consumption unit between 2 and 40 cm^3, in particular between 2 and 12 cm^3, depending inter alia on the kind of beverage.

The frequency with which the pulses are given is normally between 1.5 and 50 per second, and will depend on the nature of the concentrate. According as its viscosity is higher, we prefer lower frequencies.

For coffee and tea concentrates, which may have a very high and highly variable viscosity, but on the other hand must be rapidly dispensed by the machine (as there is often quite a rush on the machines for these popular drinks) we preferably employ frequencies of 5 to 50 pulses per second.

Naturally the metering appendix will preferably be made as compact as possible.

Preferably, metering will be effected with whole pulses, which mean that the fraction X/Y=N is an integer. One manner in which this can be achieved will be described hereinafter.

The signal for operating the metering device may be such that all times a pre-determining number of pulses, pre-set and stored in the apparatus, is generated. This pre-determined number may correspond to that required for one consumption unit, but also to that required for a multiple thereof. Detecting and counting means are provided to compare the pre-set and stored number, with the number of pulses. The detecting and c unting means will n rmally include a pulse counter. The means for pre-setting and storing may be manually operable, but other known methods are not excluded.

The signal may, however, also consist of two parts, in the sense that the first part of the signal puts the metering device into operation, and the second part stops the metering device, so that each time a desired quantity can be metered to suit the wishes of the user. The first part of the signal may, for example, be introduced by pressing a button, while releasing the button introduces the second part of the signal. The volume of a consumption unit can then be varied at will, but there is also the possibility of an adjustment at which a whole number of consumption units for a random volume is dispensed. For this purpose the apparatus may be provided, for example, with three buttons each of which serves for one of the functions just described.

Preferably, volume Y is adjustable, which may be effected by varying the intensity of the pulses, i.e. the portion of the volume between the two valves of the metering appendix which is expelled during each pulse. The metered volume of X can be varied by varying Y as just indicated, but also by varying the number of pulses.

For good practicability, it is of importance that the dispensing of a normal consumption unit should not take too long. What can be tolerated depends on the nature of the produce. For coffee and tea concentrates, for example, the above parameters will preferably be so selected that the dispensing takes one to two seconds per consumption unit.

The variation in volume between the two valves of the metering appendix, as referred to hereinabove, can be effected by exerting a force (preferably pressure) transversely to the direction of the flow of extract. However, the exertion of force (preferably pressure) in the direction of the flow of extract current is also possible.

The exertion of force for generating the pulses can be effected by mechanical interaction between a force exerting system fixedly connected to the body of the beverage vending machine, and the elastic portion of the metering appendix.

However, electromagnetic interaction is also possible when a magnet (e.g. an electromagnet) is provided in the beverage vending machine and the metering appendix is provided with magnetizable or magnetized material.

Furthermore, a mechanical interaction can be introduced by an electromagnetic one, e.g. in the manner mentioned hereinafter as a "third" possibility.

It may be of importance, in particular when electromagnetic interaction is used for generating the pulses, to give the pulses a well-defined magnitude by means of fixed points "stops").

It is understandable that the characteristics of

the resilient lastic material on which f rces are exerted by the pulses, and the characteristics f the valves must satisfy certain requir ments and be attuned to each other to produce as accurate metering as possible. The elastic material should preferably have such a resiliency that at the moment when a next pulse begins, it has fully resumed its original shape.

In connection with the above, it is of importance that the number of pulses per second should not be taken too large. The lower valve must not have an unduly low sensitivity to prevent leakage—in particular during handling of the disposable container. Preferably the sensitivity should be between 40 and 500 millibars, and more specifically between 250 and 300 millibar.

The upper valve must be able to open quite easily, in most cases the resiliency of the elastic material of the metering appendix must be sufficient for the purpose. Preferably its responsiveness is between 0.1—30 millibars, more specifically between 2 and 4 millibar.

The disposable container may be both rigid and flexible, i.e. collapsible when emptied. In the first case, when used for self-preserving extract, the container may be provided at the top with a small aperture sealed with a tape that can be stripped off.

In a preferred embodiment of the invention, the resilient elastic material is situated between the two valves.

A practical embodiment is that in which the metering appendix has a substantially cylindrical shape, in particular a tubular shape.

Very suitable for a metering appendix is, for example, a tube of polyester elastomer (such as "Arnitel" of Akzo and "Hytrel" of Dupont) of sufficient "hardness" and "wall thickness". These materials are also very suitable, for that matter, for the elastic portion of the metering appendix if it has a different shape from that of a tube.

Conveniently an elastomer tube of $\frac{1}{2}$—3 mm wall thickness and a hardness of 20—80 shore D may be used, and preferably with a wall thickness of 1—2 mm and a hardness of 30—60 shore D.

The metering device according to the invention is of particular importance in the case of highly-concentrated extracts which may exhibit variable viscosites, for example, owing to temperature fluctuations or on standing.

This is the case, for example, with concentrated coffee extract and concentrated tea extract. To these last, gum-like substances must be added to prevent sedimentation ("creaming").

These differences in viscosity may also be the result of process variation during production, variations in raw materials and/or temperature fluctuations when the product is stored without, or with insufficient temperature control. Besides, in the case of fruit juice concentrates, variations in the content of pulp in the concentrate may cause variations in flow characteristics.

A tube-shaped metering appendix may suitably be used in co-operation with a rotary mechanism provided with means of pulsatingly impressing the hose in transverse direction.

The invention will now be d scribed further, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a container with metering appendix according to the present invention, and showing the mechanism for applying the pulses;

Fig. 2 is a view of the pulsing mechanism in a direction perpendicular to the longitudinal axis;

Fig. 3 is a perspective view of the pulsing mechanism (without motor; reduction gearbox and frame) in somewhat greater detail than is apparent from Fig. 1; and

Fig. 4 is a block diagram of the electronic circuitry for operating the pulsing mechanism.

Referring to the drawings, a flexible container is shown dotted at 1 within a cardboard packing box 2 in Fig. 1. Shown at 3 is a tube-like metering appendix, which is sealed to the flexible container by means of a transparent nipple 4 of synthetic plastic material. Adaptor 4 has a narrower portion 5 (see Fig. 2) around which a body 6 of synthetic plastic material is fastened by means of a snap connection. Clamp fitted in body 6 is a rubber beak valve 7. A piece of polyester elastomer tube 8, 108 mm long and having a wall thickness of 1.35 mm (type Arnitel EM 400; shore D hardness 40) is clamp fitted around body 6 at the top. At its bottom end, this piece of hose is clamp fitted around a nipple 9 of synthetic plastic material, in which a mushroom-shaped insert 10 of silicone rubber is clamped by means of radial ribs 11. The bottom aperture of nipple 9 is closed by the "hat" of the mushroom-shaped insert 10. Parts 9 and 10 co-operate as a non-return valve, that is to say, when a pressure prevails in the metering appendix, the "hat" is deflected outwards, and concentrate issues from nipple 9.

Hose 18 has a "backing" in the form of a metal "bed" 14. The part 14 can be "lined" with a flaccid elastic tube (not shown) which separates the dosing tube from the force-exerting means. This prevents contamination of the force exerting means by beverage concentrate, if by careless handling some spillage of concentrate might occur.

Rollers 15 are mounted for free rotation on shafts 16, secured to a partially hollow body 17. This body 17 is connected by means of a flange 26 to the output shaft of reduction gear box 19, the input shaft of which is connected to a motor 18, the arrangement being such that body 17 can be rotated. The output shaft of the gear box rotates at a speed, for example, of 180 rpm. When body 17 is rotated tube 8 is then given six pulses per second. The number of pulses per second, and hence the quantity of each dose can be varied by varying the voltage when motor 18 is of the kind whose speed depends on the voltage applied.

It is also possible to vary the spacing of the rollers, whereby the intensity of each pulse (i.e. the extent to which the hose is depressed during each

pulse) and hence the volume dosed during each pulse is varied.

Shafts 16 of rollers 15 are mounted in inserts 20 and 20' in body 17. Insert 20 is provided with internal, left-hand screw-thread, insert 20' with righ-hand internal screw-thread. The inserts are interconnected by means of a threaded spindle (not shown), one of the ends of which is shown at 21. This threaded spindle is provided at the region where it cooperates with insert 20 with external left-hand screw-thread, and at the region where it cooperates with insert 20' with external right-hand screw-thread. The spindle is positioned by means of a block in which it is freely rotatable. The outside of this block, secured with two screws, is shown at 22.

In order that, at all times, a whole number of pulses is administered, and to ensure that upon termination of a dispensing step the rollers 15 are free from hose 8, two holes 23 are provided in the hollow part of body 17, which cooperate with a photo-electric interruptor 24. One leg of 24 is provided with a light source, the other with a photocell (shown in Fig. 4). A suitable interruptor is TKF.SF.CNY.37 of AEG/Telefunken. Upon the passage of one of the holes 23, the interruptor generates an electrical signal, which can be used to count the number of pulses given, and when the desired number has been reached to stop the motor. Normally the stopping of the motor requires some time, and therefore the holes will be somewhat off-set relative to the rollers, so that these can move through a certain braking distance after the stop signal. The stop signal can best be given by short-circuiting the motor (as a consequence the braking distance is always equal). By all this it can be achieved that the rollers are always in a correct stationary position.

Also secured to frame 25 is a device 27 for signalling when the container is empty. For that purpose the device comprises a photo-electric interruptor (not shown). As indicated hereinbefore, nipple 4 is transparent, so that the presence or absence of somewhat light-absorbing liquids within the nipple can be detected.

The apparatus as described can be operated, by way of example, in accordance with the block diagram illustrated in Fig. 4.

The motor is indicated at 18. Disc 17 with holes 23 therein is secured to the output shaft of the motor. A light transmitter 41 and receiver 40 are disposed in the photo-electric interruptor 24 in such a manner relative to each other that upon rotation of the shaft of motor 18 the light path between transmitter 41 and receiver 40 is open during the passage of a hole 23. As a result, upon each passage of a hole an electrical pulse is given to the presettable electrical counter 47. The counter is capable of increasing its position by one each time a pulse is received by receiver 40. Counter 47 can count from 0 to P. When the counter has the position P no signal is generated. When counter 47 has a position of from 0 to P-1, the counter gives a signal to relay 44. If the relay is energized, switch 45 is put into the position in which via contacts r and s, the adjustable voltage of the source of voltage 46 causes the mot r to run. If relay 45 drops out, the voltage from 46 is turned off, and the motor is shorted via contacts t and r.

The apparatus is provided with switches 48, 49 and 50, operated for example by press-buttons. Operation of one of the switches 48, 49, 50 can cause the motor to function in three different manners.

When switch 50 is operated, the counter is set in a position p. The counter receives an output signal, and the motor starts to run. The pulses from photo-receiver 40 increase the position of the counter by one at the time. When the position P is reached, the output signal drops out, and the motor stops through short-circuiting in the manner described. The input PSI of counter 47 has been made so that operation of switch 50 results in only one pre-set of the counter. Holding the button for switch 50 for a longer period of time does not affect the position of the counter any further.

When the button for switch 49 is pressed, the counter is pre-set in a position P. The counter receives an output signal and the motor starts running. The pulses from 40 increase the position of the counter by one at the time. When the counter has reached the position P-1 and switch 49 is still on, the next pulse will pre-set the counter to p.

When switch 49 is off the counter can reach the position P, and the motor stops. When switch 48 is operated the counter is pre-set in the position P-1. The counter receives an output signal and the motor starts to run. So long as switch 48 is on, counter 47 remains pre-set in position P-1. When switch 48 is off, the pulses can increase the position of the counter. The first pulse arising after the button of switch 49 has been released will put the counter into position P, and the motor stops.

The adjustable pre-set of counter 47 can be realized in various known manners by using different counters having a fixed pre-set, or a counter having several pre-set inputs which can be operated by means of a switch.

In addition to the system described in detail above, there are a large number of other possibilities for dispensing concentrate in accordance with the present invention. A number of examples will be briefly described hereinafter.

As a second possibility, the metering appendix—made of tubular elastic material—with the two valves is placed in the vending machine between two plates, at least one of which is movable at right angles to the longitudinal direction of the hose. The plate(s) can be moved in a pulsating manner, whereby a portion of the hose is emptied. The plates can be driven for example, by means of a motor with an eccentric. The intensity of the pulse can be varied either by varying the size of the plates, or the depth through which the tube is impressed.

A third possibility is the following: a tube-like

metering appendix as described is placed in a pipe. The pipe has a hole of approximately 6 mm in diameter, through which a pin can be moved at right angles to the tube in a pulsating manner, thereby dispensing concentrate. The pin may be placed, for example, in the core of an electromagnet, which when energized, causes the pin to move towards the tube, impressing it.

According to a fourth possibility, a circular symmetric double-walled body is placed around a tube-like metering appendix, the outside of which body is rigid, and the inside being made of elastic material. The space between the two walls is filled with a magnetizable powder which, when not in a magnetic field, behaves as a fluid. A coil secured around the body will magnetize the powder when energized, thereby effecting a constriction of the metering tube. The metered volume can be varied by varying the frequency of energizing the coil.

According to a fifth possibility, the tubular appendix is surrounded by a body which can be opened and closed in the way of an iris diaphragm, driven by a motor. Adjustment is possible by varying the degree of closing or the frequency.

According to a sixth possibility, the tubular metering portion is provided at the bottom with some projections which fall into recesses in the vending machine. These recesses are secured to a body which, driven by a motor, can be rotated clockwise and counter-clockwise. As a result the hose is twisted in pulsating manner, whereby extract is dispensed.

According to a seventh possibility, the metering appendix is not a tube, but a plastic (rigid) chamber with an elastic membrane on one side. Naturally this chamber is closed at the top and bottom by means of a valve. Secured to the membrane is a flange which, when the metering appendix is placed in the vending machine, falls into a holder, which can be moved in a pulsating manner in a direction perpendicular to the above membrane.

According to an eighth possibility, a piece of soft iron is fixedly secured to the elastic membrane as just described, which, when installed in the vending machine, co-operates there with an electromagnet. Energizing and de-energizing the electromagnet produces a pulsating reduction in volume in the chamber between the two valves and hence concentrate is dispensed in a pulsating manner. The piece of soft iron can be replaced by a permanent magnet, which makes it possible, using an alternating magnetic field, which may be produced by applying AC voltage to the electromagnet, to both increase and decrease the volume in the chamber without substantially depending on the resiliency of the material of the membrane.

In a ninth possibility, the space between the two valves is a cylindrical chamber with rigid top and bottom. The wall of the cylinder is either a gas-filled circular ring, or such a ring of foamed synthetic plastics material with closed cells. Fixedly connected to this place is a soft iron ring which when placed in the vending machine cooperates with an electromagnet which produces an alternating magnetic field. This compresses the ring, whereby the volume between the two valves is decreased in a pulsating manner.

The invention naturally also relates to the methods underlying the apparatuses according to the invention as described above.

Preferred parameters for the various kinds of beverage concentrates are listed in the following table.

	x	*N*	*Pulses per second*
Tea	2—4	6—100	2—50
Coffee	4—12	6—100	2—50
Chocolate	20—40	15—100	1.5—10
Fruit juices	20—40	15—100	1.5—10
Syrups	20—40	15—200	3—20
Beer	20—40	10—200	2—50

The invention provides also the disposable container mentioned above, per se, whereby the first outwardly opening non-return valve has a sensitivity between 40 and 500 millibar, preferably between 250 and 300 millibar, and the second inwardly opening non-return valve of the dispensing appendix a sensitivity between 0.1 and 30 millibar, preferably between 2 and 4 millibar.

More specifically the invention provides a disposable container for storing and transporting beverage concentrate and for dispensing increments of the concentrate when installed in a beverage dispensing unit according to the invention, said container comprising a reservoir for beverage concentrate, a dispensing appendix having one end permanently connected to said reservoir and being in communication with said reservoir via a non-return valve with a sensitivity of 0.1—30 millibar, opening into said dispensing appendix, said dispensing appendix having an opposite free dispensing end, formed by an outwardly opening, non-return valve, with a sensitivity of 40—500 millibar, which has a normally closed dispensing outlet, and said dispensing appendix being at least partly resiliently flexible and thereby adapted to be squeezed by a pulsating squeezing device in a dispensing machine whereupon a required number of increments of beverage concentrate will be dispensed from said container through said dispensing outlet.

Preferably, the sensitivity of the first non-return valve of the disposable container opening into said dispensing appendix is 2—4 millibar, and the sensitivity of the second outward opening non-return valve is 250—300 millibar.

Claims

1. Method for automatic metering of a beverage concentrate in a beverage dispensing or

vending machine comprising connecting a reservoir containing the beverage concentrate to the "passiv " secti n of a diaphragm pump and bringing this section into automatic co-operation with the force exerting section of said pump in response to an appropriate signal, said force exerting section being integral with the body of said dispensing or vending machine.

2. Method according to claim 1 for automatically metering out a consumption unit or a multiple thereof of a beverage concentrate, particularly one of high and variable viscosity in a beverage dispensing or vending machine, said consumption unit having a volume X or a multiple thereof, whereby the metering is accomplished from a reservoir forming a disposable unit with a metering appendix, said metering appendix co-operating with force-exerting means integral with the body of the beverage dispensing or vending machine, said force-exerting means being shaped in such a way as to tally with and receive said metering appendix by simple insertion without disassemblage of said force-exerting means or distortion of said metering appendix, comprising at an appropriate start signal automatically and pulsatingly engaging said metering appendix by said force-exerting means, such as to meter out the beverage concentrate in a series of consecutive pulses, each pulse corresponding with the metering out of a volume Y, and stopping at an appropriate stop signal, when the number of pulses has reached a number N, or a multiple thereof, said number N corresponding to the desired volume X of beverage concentrate, N being equal to X/Y and at least six.

3. Apparatus for the automatic dosing of a beverage concentrate when installed in a beverage dispensing or vending machine comprising a diaphragm pump, the passive section of which is connected to a reservoir for the beverage concentrate, the force exerting section of said pump being integral with the body of the dispensing or vending machine.

4. Apparatus according to claim 3, whereby the characteristics of the diaphragm pump and the intensity and frequency of the pumping pulses of said diaphragm pump are geared to each other in such a way that in between two of said pumping pulses said diaphragm is fully restored to the position before the start of the first of said two pumping pulses.

5. Apparatus according to claim 3 or 4 whereby said force exerting section of the diaphragm pump is shaped in such a way as to tally with and receive said passive section by simple insertion without disassemblage of said force exerting section or distortion of said passive section, and said passive section is integral with the reservoir for the beverage concentrate, these two forming together a disposable unit.

6. Apparatus for accurately metering out a consumption unit or multiple thereof of beverage concentrate, in particular one of high and variable viscosity in a beverage dispensing or vending machine, said consumption unit having a volume X, comprising in operative co-operation:

a disposable container comprising a reservoir containing the beverage conc ntrate and integral with the "passive" section of a diaphragm pump,

means responsive to an appropriate signal for automatically energizing the force-exerting section of said diaphragm pump,

said force-exerting section of said diaphragm pump being integral with the body of the beverage dispensing or vending machine and being shaped in such a way as to tally with and receive said passive section of said diaphragm pump by simple insertion without disassemblage of said force-exerting section or distortion of said passive section, and

means for de-energizing the force-exerting section of said diaphragm pump when the volume X respectively a multiple thereof has been reached.

7. Apparatus for accurately metering out a consumption unit or multiple thereof of beverage concentrate, in particular one of high and variable viscosity when installed in a beverage dispensing or vending machine, said consumption unit having a volume X and being incrementally adjustable by increments of volume Y, comprising in operative co-operation:

a disposable container consisting of a reservoir with beverage concentrate, integral with a metering appendix at least partially of resilient elastic material, said appendix being provided with a first non-return valve opening to the outside, and a second non-return valve opening to the inside,

force-exerting means responsive to an appropriate start signal for automatically exerting a pulsating force on the resilient portion of the metering appendix, such as to alternatingly decrease and restore the volume between the two valves, while these continue to be in open communication with each other, said force-exerting means being integral with the body of said dispensing or vending machine and being shaped in such a way as to tally with and receive said metering appendix by simple insertion without disassemblage of said force-exerting means or distortion of said metering appendix,

means for counting the number of exertions of said force extorting means, and

means, responsive to an appropriate stop signal for stopping the dispensing when the count is equal to a desired number N, respectively a multiple thereof, while N=X/Y, the arrangement being such that on each pulse an accurately metered volume Y of the beverage concentrate leaves the appendix through the first valve and subsequently an equal volume enters said appendix from the container through the second valve, the volume X being at least six times the volume Y.

8. Apparatus as claimed in claim 6 or 7, adapted to dispense 2—40 cm^3 beverage concentrate per consumption unit.

9. Apparatus as claimed in claim 8 for dispensing coffee and tea concentrate, adapted to

dispense 2—12 cm^3 concentrate per consumption unit.

10. Apparatus as claimed in any one f the claims 6 to 9, adapted to produce 1.5—50 pulses per second.

11. Apparatus as claimed in claim 10 for dispensing coffee and tea concentrate, adapted to produce 5 to 50 pulses per second.

12. Apparatus as claimed in any one of the claims 6 to 11, provided with means by virtue of which the number of pulses produced is always an integer.

13. Apparatus as claimed in any one of the claims 6 to 12, characterized by means for forming three alternative or sets of signals, being one in which concentrate is dispensed for one consumption unit, one in which concentrate is dispensed for a whole number of consumption units, and one in which the volume of concentrate metered out can be varied at will.

14. Apparatus as claimed in any one of the claims 6 to 13, provided with means for adjusting the intensity of the pulses.

15. Apparatus as claimed in any one of the claims 6 to 14, provided with means for adjusting the number of pulses produced per second.

16. Apparatus as claimed in any one of the preceding claims 6 to 12, provided with means for adjusting the number of pulses produced per consumption unit.

17. Apparatus as claimed in any one of the claims 5 to 16, adapted to dispense beverage concentrate for one consumption unit in a period of time ranging from 1 to 7 seconds.

18. Apparatus as claimed in claim 17, for dispensing coffee concentrate and tea concentrate, adapted to dispense the concentrate in a period of time of 1—2 seconds.

19. Apparatus as claimed in any one of the claims 6 to 18, including means for alternatingly changing the volume of the dosing appendix at each pulse by exerting a force perpendicular to the extract stream.

20. Apparatus as claimed in any one of the claims 6 to 18, including means for effecting the alternating change in volume at each pulse by exerting a force in the direction of the extract stream.

21. Apparatus as claimed in any one of the claims 6 to 20, including means for a mechanical interaction between a force exerting system, integral with the vending machine, and the elastic portion of the metering appendix.

22. Apparatus as claimed in any one of claims 6 to 20, including means for an electromagnetic interaction between an electromagnetic force exerting system, integral with the body of the dispensing or vending machine, and a magnetizable or magnetic system integral with the elastic portion of the metering appendix.

23. Apparatus as claimed in any one of the claims 6 to 22, characterized in that the responsiveness of the valve of the metering appendix opening to the outside ranges between 400 and 500 millibar, preferably between 250 and 300 millibar and the responsiveness of the valve opening to the inside ranges between 0.1 and 4.0 millibar, preferably between 2 and 4 millibar.

24. Apparatus as claimed in any one of the claims 6 to 23, characterized in that the resilient elastic portion of the metering appendix is situated between the two valves.

25. Apparatus as claimed in any one of the claims 6 to 24 for self-preserving extracts, characterised in that the reservoir of the disposable container is rigid and has an aperture that can be sealed by means of a tape that can be stripped off.

26. Apparatus as claimed in any one of the claims 6 to 24 characterized in that reservoir of the disposable container is flexible, i.e. collapses when emptied.

27. Apparatus as claimed in any one of the claims 6 to 26, characterized in that the metering appendix has a substantially cylindrical shape.

28. Apparatus as claimed in claim 27, characterized in that the metering appendix is shaped as a tube.

29. Apparatus as claimed in any one of the claims 6—28 characterized in that the resilient elastic portion of the metering appendix is made of polyester elastomer of suitable hardness and wall thickness.

30. Apparatus as claimed in claim 27 or 29, including a rotary mechanism with means for depressing the metering tube in a transverse direction in a pulsating manner.

31. A disposable container for storing and transporting beverage concentrate and for dispensing increments of the concentrate when installed in a beverage dispensing unit according to one of the claims 5—31, said container comprising a reservoir for beverage concentrate, a metering appendix having one end permanently connected to said reservoir and being in communication with said reservoir via a non-return valve with a sensitivity of 0.1—30 millibar, opening into said metering appendix, said dispensing appendix having an opposite free dispensing end, formed by an outwardly opening, non-return valve with a sensitivity of 40—500 millibar, which has a normally closed dispensing outlet, and said metering appendix being at least partly resiliently flexible and thereby adapted to be squeezed by a pulsating squeezing device in a dispensing machine whereupon a required number of increments of beverage concentrate will be metered out of said container through said metering outlet.

32. A disposable container according to claim 31, wherein the sensitivity of the non-return valve opening into said metering appendix is 2—4 millibar, and the sensitivity of the outwardly opening non-return valve is 250—300 millibar.

33. A disposable container according to claim 31 or 32 the resiliently flexible part of the metering appendix being of an elastomer of convenient hardness and thickness.

34. A disposable container according to any

on of the claims 31—33 whereby the met ring appendix has the shape of a tube.

35. Metering app ndix, comprising the passive section of a diaphragm pump, for dispensing increments of beverage concentrate when installed in a beverage dispensing or vending machine, whereby the diaphragm is an elastomer tube, with a wall thickness of $\frac{1}{2}$—3 mm and a shore D hardness of 20—80.

36. Metering appendix according to claim 35, whereby the wall thickness is 1—2 mm and the shore D hardness is 30—60.

37. Metering appendix according to claim 35 or 36, whereby the non-return valve opening into said dispensing metering has a sensitivity of 0.1—30 millibar and the outwardly opening non-return valve has a sensitivity of 40—500 millibar.

38. Metering appendix according to claim 37, whereby the non-return valve opening into said metering appendix has a sensitivity of 2—4 millibar and the outwardly opening non-return valve has a sensitivity of 250—300 millibar.

39. Apparatus as in any one of the claims 6—30, including means for detecting and counting the number of exertions of said force, means for manually presetting and storing said number N or multiple thereof and means for comparing said manual preset number and the number of exertions to produce the appropriate stop signal.

40. Apparatus as in claim 39, wherein said detecting and counting means includes a pulse counter.

41. Apparatus as in claim 39, wherein said force exerting means includes a rotary member and said detecting and counting means for detecting the rotations of said member to produce a train of pulses includes means for counting said pulses.

42. Apparatus as in claim 41, wherein said means for setting includes switch means for setting any of a plurality of numbers.

43. Apparatus as in claim 6, including means for producing said appropriate start and stop signals.

44. Apparatus as in claim 6, wherein said decreasing means includes a rotary member and at least one roller mounted thereon for pulsatingly compressing said elastic portion as said rotary member is rotated.

45. A method for the automatic metering of a beverage concentrate, substantially as hereinbefore described, with reference to the accompanying drawings.

46. Apparatus for the automatic metering out a beverage concentrate, substantially as hereinbefore described, with reference to and as illustrated in the accompanying drawings.

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